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## THE INFILTRATION METHOD OF LOCAL ANESTHESIA IN GENITO-URINARY SURGERY.

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In July, 1894, at the German Congress of Surgeons (afterwards presented in the *Therapeutische Monatshefte*, No. 9, 1894), Dr. Schleich announced and detailed a new method of producing local anesthesia by the use of intra-cutaneous (rather than sub-cutaneous) injections of very dilute solutions of various drugs; and he indicated the distinctiveness of the method by terming it Infiltration Anesthesia. Later, in a monograph entitled "Schmerzlose Operationen," Berlin, 1894, the author treated the subject more extensively, and gave the results of its use in some three thousand operations, minor and major.

During 1894, the method received some attention from the American medical press, and was put to practical test by American surgeons. Dr. H. V. Würdemann, of Milwaukee, presented the subject in an admirable manner in the *Journal of the American Medical Association*, December 29, 1894.

The principle of the method consists in injecting intra-cutaneously certain solutions and dissipating the sensibility of the peripheral nerves by the pressure of the infiltrating fluid, by the anemia which it causes, and by the comparatively low temperature at which it is injected—three effects secured by the *fluid itself* rather than by any drug which it may contain. As a matter of fact, the drugs used are of only incidental importance.

It has long been known that the injection of fluids in some considerable quantity would cause a deadening of the sensibility of the part; but the induction of this insensibility has not been sufficiently controllable to place it within the limits of wide surgical practicability; and the initial pain to which it would give rise, was another objectionable feature which discounted its usefulness.

By thought and much experimentation these problems, as well as others, have been practically overcome by Dr. Schleich; so that for the kind of surgery to which the *injection* of anesthetizing fluids is applicable, whether "minor" or "major", the use of the older cocaineizing methods is liable to be entirely superseded by the infiltration method; and the position of chloroform and ether narcosis is already being assailed by those who have made practical use of it. \*



If a syringe-needle be inserted obliquely into the skin, the point reaching just below the epidermal layer, and a few drops of the proper fluid be injected there, an elevated wheal, looking like a mosquito-bite, will be the result; and tests with a needle or knife immediately afterwards will show the entire area of the wheal to be absolutely insensible, while the sensibility of the skin just beyond the edematous area is not disturbed in the least.

Experimentation has shown that the promptitude and practical efficacy of the anesthesia so induced depend on several factors: (1) The density of the fluid used; (2) The character and strength of the drug or combination of drugs embodied in the solution; (3) The temperature of the latter; (4) The condition (of health or disease) of the tissues to be anesthetized; and, (5) The maintenance of complete edema of the tissue to be operated upon.

**DENSITY OF THE FLUID.** It has been found that a physiologic salt solution, 0.6 per cent, would cause a wheal but not an anesthetic one; while a 0.2 per cent salt solution produced sufficient anesthesia to allow of the removal without pain, of a nevus from the neck of the eminent Dr. Bergmann. Solutions of sugar, 3 per cent; potassium bromide, 3 per cent; morphine, 0.1 per cent; carbolic acid, 0.5 per cent; and caffeine, 2 per cent; all show markedly anesthetic effects, while above and below those strengths they become irritative and painful. This develops the second-named factor,

**THE CHARACTER AND STRENGTH OF DRUGS USED.** While it is a fact that the various agents mentioned will produce anesthesia after a certain length of time, the first and primary effect of some of them is irritative, and they excite pain until their secondary, anesthetic effect begins to prevail. In order to obviate this difficulty, use is made, in the formula, of certain drugs (cocaine, morphine) which in proper strength have an immediate anesthetic effect, thus doing away with the transient irritative effect of the other, secondarily, anesthetic drugs in the combination. This is especially important when considered in connection with

**THE CONDITION (OF HEALTH OR DISEASE) OF THE STRUCTURES TO BE OPERATED UPON.** While the difference in the primary-irritative and the secondary-anesthetic effect may not be so sharply marked in normal, healthy tissues, as in the removal of a nevus, in the case of inflamed structures (crucial incisions into a carbuncle), it is markedly prominent; and unless it were prevented, it would defeat the purpose and advantages of the method. Happily, this is accomplished in either of several ways: By using such drugs in the combination (cocaine, etc.) as have an immediate anesthetic effect, even though diluted to the degree mentioned; by beginning the anesthesia in healthy structures and continuing it by successive injections into the unhealthy ones; by producing a temporary spray-anesthesia of the inflamed structures, sufficient to allow of the introduction of the infiltrating fluid. Of these, the first will be found to be most commonly useful; and it is for that reason, chiefly, that cocaine is used at all. However, the point must be emphasized that though cocaine is used in this way, it is vastly different from the manner of using it hitherto in vogue; since, instead of using a strength of from two to ten or twenty per cent,

the strength entirely capable, by this method, of producing the anesthesia desired is that of one or two *hundredths* per cent; and instead of a very few drops producing a toxic (perhaps a highly dangerous) effect, one or two or three *ounces* may be used without the slightest systemic symptom.

**TEMPERATURE OF THE INJECTED FLUID.** It has been observed that the same strength of solution, when used cold, is much more highly anesthetic than if it is warm. For this reason, it is advised to keep the bottle of fluid on ice before and during the operation.

**COMPLETE INFILTRATION.** Every tissue of the body, without exception (skin, muscles, glands, mucous membrane, nerves, etc.), becomes insensible to pain when infiltrated in the manner described. This obtains for bone and the hard structures, as well as the soft ones. Bone is reached either through infiltrating its periosteum or by injecting into the medulla. Nerve trunks are anesthetized separately, first by applying five per cent carbolic acid solution, and then, through this, inserting the needle and fluid.

Only the infiltrated, artificially edematous tissue is anesthetic, the tissues just outside of which retain normal acuteness of sensibility. Consequently, in the course of an operation, with absorption of the infiltrated fluid, it is necessary to renew the injections or extend their area co-incidentally with the operative field. After infiltration, the anesthetic condition lasts from fifteen to twenty minutes.

With the proper fluid, anesthesia ensues *immediately* on its being introduced into the tissues, and lapse of time is not requisite for developing insensibility. This, again, is in marked contrast to the effect of the older methods of producing anesthesia. Its advantage is great.

**HEMORRHAGE.** Anemia being one of the effects of the method, it may be supposed that there will be less bleeding (oozing) than under ordinary circumstances. This is the case. And distortion of the tissues from the infiltrated fluid does not cause any especially increased difficulty in securing and tying or twisting bleeding vessels. Nevertheless, in operating in deeper structures, the use of the syringe-needle involves the risk of piercing blood vessels, nerves, etc., for which care must be observed.

**FORMULÆ.** In his various surgical procedures, Dr. Schleich finds the following three solutions of graded strengths to answer all purposes:

#### STRONG SOLUTION, No. 1.

R	Cocain. muriat.,	-	-	-	-	gr. iii.
	Morph. muriat.,	-	-	-	-	gr. i-3.
	Natr. chlor.,	-	-	-	-	gr. iii.
	Aq. dest.,	-	-	-	-	ad oz. iii.
m.	Sterilisat., adde sol. acid. carbolic.,	5 per cent,	gtt.	iii.		

#### MEDIUM-STRENGTH SOLUTION, No. 2.

R	Cocain. muriat.,	-	-	-	-	gr. iss.
	Morph. muriat.,	-	-	-	-	gr. i-3.
	Nat. chlor.,	-	-	-	-	gr. iii.
	Aq. dest.,	-	-	-	-	ad oz. iii.
m.	Sterilisat., adde sol. ac. carbolic.	5 per cent,	gtt.	iii.		

### WEAK SOLUTION, NO. 3.

R	Cocain. muriat.,	- - - - -	gr. i-6.
	Morph. muriat.,	- - - - -	gr. i-12.
	Natr. chlor.,	- - - - -	gr. iii.
	Aq. dest.,	- - - - -	ad oz. iii.
m.	Sterilisat., adde sol. ac. carbolic.	5 per cent,	gtt. iii.

Solution No. 1, Dr. Schleich uses for operating on inflamed or hyperesthetic areas; No. 2, for most operations; No. 3, for superficial operations on nearly normal tissues.

To carry out the aims of asepsis, he recommends that only sterile solutions be used; and to this end, he advises that the reservoirs be sealed with scorched-cotton stoppers, and that from these smaller vessels should be filled at the time of operating.

I have made use of the infiltration method in operating on buboes (enucleation); in opening a prostatic abscess through the perineum; in circumcisions and some other minor procedures.

In working in superficial structures, its effect is all that one could wish and beyond criticism. While in the deeper parts of wounds such as met with in evacuating prostatic abscess, enucleating buboes, etc., it is more difficult to secure complete and absolute anesthesia, on account of the care necessary to prevent the injury of deep-lying structures, still, with the increased skill obtained by practice, objections on this line are removed and local anesthesia is effected with proportionately increasing success. It appears to me that testicular ablation, for instance, could be done without a particle of suffering on the part of the patient.

The after-pain I have not found to be greater than with other modes of anesthesia; and the other disagreeable after-effects of general anesthesia are, of course, avoided. Two of my patients were over sixty years old, yet they felt as well after as before the operations. No symptom of intoxication has become evident in any case that I have observed, and I have not been sparing in the use of the fluid.

I have made use of a larger syringe and longer needle than that recommended by the author, and I think this facilitates matters considerably, obviating numerous successive punctures in order to fill up the tissues sufficiently. The infiltration may be begun with a small syringe and fine needle and continued, without pain, with the larger.



